Rules

• You may work together, but you are expected to turn in your own writeup of answers.

• HW is due on sakai by the beginning of class.

• Better to hand an answer in late than not at all.

• Email questions to TAs/professor or ask in class.
1. How Many Pops?

A. When the flag is clicked, how many times will the pop sound happen before everything stops?

B. What value will num have at the end?

2. Parity-16

An “xor” gate takes two bits as input, A and B. It produces one bit of output, which is equal to True if an odd number of bits (exactly one of A and B, in this case) are True. It can be constructed out of 2 nots, 1 or, and 2 ands.

If we generalize to a “Parity-k” gate, there are k input bits and still one output bit, which is True if an odd number of inputs are True. It can be constructed out of k-1 separate “xor” gates.

How many nots, ands, and ors does it take to make a “Parity-16” gate?
3. A Machine Says What?

What will $E$ be after each of these short machine-language programs are executed? Give a logical expression like $E = \ldots$

(A) \[
\begin{align*}
\text{acc} &= \text{not } B \\
E &= \text{acc} \\
\text{acc} &= A \\
E &= \text{acc and } E
\end{align*}
\]

(B) \[
\begin{align*}
\text{acc} &= B \\
E &= \text{acc} \\
\text{acc} &= A \\
E &= \text{acc and } E \\
\text{acc} &= \text{not } C \\
\text{acc} &= \text{acc or } A \\
E &= \text{acc and } E
\end{align*}
\]

4. Halt or Not?

For what values of “?” does each of these Scratch scripts halt? (“*” means multiplication.)

(A) \[
\begin{align*}
\text{set count to } &? \\
\text{repeat until } &\text{count > } 55 \\
\text{play sound } &\text{pop } \text{and wait} \\
\text{change count by } &2 \\
\end{align*}
\]

(B) \[
\begin{align*}
\text{set count to } &? \\
\text{repeat until } &\text{count > count + 1} \\
\text{play sound } &\text{pop } \text{and wait} \\
\text{change count by } &1 \\
\end{align*}
\]

(C) \[
\begin{align*}
\text{set count to } &? \\
\text{repeat until } &\text{count > } 100 \\
\text{play sound } &\text{pop } \text{and wait} \\
\text{change count by } &2 \\
\end{align*}
\]

(D) \[
\begin{align*}
\text{set count to } &? \\
\text{repeat until } &\text{count < 2} \\
\text{play sound } &\text{pop } \text{and wait} \\
\text{change count by } &1 \\
\end{align*}
\]
5. Happy Halloween!

Download scratch. Write a program that could act as a Halloween card for someone of your choosing (friend, teammate, family member, pet, celebrity).

Your program should include some:

- animation
- sound
- keyboard interaction

To turn in your program, you can upload it to sakai as an attachment or upload it to the scratch site and send us the URL.

6. Sing a Song

Write a scratch program that prints the lyrics to a song of your choosing. Use a subroutine (broadcast) at least twice.